Fig.10 shows the structure of the Triode 4. The nanotube 101 is placed on the cathode 102, which is elevated over the plane of the substrate 103 by a dielectric film 104. Two electrodes, 105 and 106, are attached to the nanotube, thus forming the cathode circuit. The anode conductive layer is placed on the substrate 103 next to the cathode, and the nanotube tip 107 is protruded into the anode area, to maximize the electron emission efficiency. As in the previous designs, according to the present invention, the contact geometry implies very low input and output capacitances. Any relatively small anode voltage $Va > V_2$ will be sufficient to provide the anode current. Because of a very small electron fly time along the nanotube and small input and output capacitances the device operational frequency is expected to be in a tera-hertz range.

All four triode structures discussed above can be extended to four- or five-terminal devices by adding additional electrodes shifted laterally further away from the anode electrode of the triode.

While there has been shown, described, and pointed out fundamental novel features of the present invention as applied to preferred embodiments thereof, it will be understood that various omissions and substitutions and changes in the devices described, in the form and details of the devices disclosed, and in their operation, may be made by those skilled in the art without departing from the spirit of the present invention. It is expressly intended that all combinations of those elements that perform substantially the same function in substantially the same way to achieve the same results are within the scope of the invention. Substitutions of elements from one described embodiment to another are also fully intended and contemplated.

What is claimed is:

1. A diode, comprised of two electrodes laterally shifted from each other and placed on non conductive substrate; the first electrode includes a conductive layer and a nanotube on top of it, the axis of said nanotube being essentially normal to one the edges of the said conductive layer and protrudes beyond said one of the edges of conductive layer; the second electrode includes a conductive layer placed on the substrate next to said one of the edges of said first conductive layer and on a plane

below the plane of said first electrode, so that said nanotube is located above and protrudes into the area of said second electrode.

2. The diode of claim 1 placed into a vacuum chamber.
3. The diode of claim 2 wherein said vacuum chamber is filled with an inert gas.
4. The diode of claim 1 wherein said nanotube is a single walled nanotube.
5. The diode of claim 1 wherein said nanotube is a metal type nanotube.
6. The diode of claim 1 wherein said nanotube is a metal type and a single walled nanotube.
7. The diode of claim 1 wherein an additional metal layer is disposed on top of a major part of said nanotube leaving exposed the nanotube tip protruded into the area of said second electrode.
8. The diode of claim of 7 wherein said additional metal layer is disposed onto entire nanotube including the nanotube tip.
9. The diode of claim 8 wherein said additional metal layer is made from a material with a low work function for electron emission into vacuum.
10. The diode of claim of 9 in which said additional metal layer is made from Cs.
13. The diode of claim 1 wherein more than one nanotube is placed on said first electrode, positioned normally to said one of the edges of said conductive layer of the first electrode and protruded into the area of said second electrode.
14. A diode comprising two electrodes laterally shifted from each other and placed ges of said first conductive layer on a plane below the plane of said first conductive layer; a small pad of nanotube catalytic material is deposited on said second coon an insulating substrate; the first electrode contains the first conducting layer; the second electrode contains the second conductive layer disposed next to one of the ednductive layer in close proximity to said one of the edges of said first conductive layer, and the nanotube is grown normally to the substrate plane; the nanotube height is such that the nanotube tip is slightly below or reaches the plane of said first conductive layer.
15. The diode of claim 14, in which said small pad of catalytic material is made from transition metals Fe, Ni or Co.

16. The diode of claim 14, wherein an array of small pads of catalytic material are deposited on said second conductive layer along said one of the edges of said first conductive layer and thus create, after the nanotube growth, an array of the nanotube electron sources.
17. The diode of claim 16, wherein said small pads of catalytic material are of the size less then micron and thickness of a few hundreds of nm to grow a single walled nanotube on each pad.
19. The diode of claim of 14 wherein said additional metal layer is disposed onto the tip of the nanotube.
20. The diode of claim 19 wherein said additional metal layer is made from a material with a low work function for electron emission into vacuum.
21. The diode of claim of 20 in which said additional metal layer is made from Cs.